Wells can provide safe, reliable sources of water for years for rural families. They can help with property values, improve convenience and simplify everything from laundry to watering the lawn.

However, wells are not for everyone. There are no guarantees with wells and once installed, they are not maintenance free.

Before any homeowner opts to install a well, there are a whole host of issues to consider, including the possibility of low-flow or dry wells, the initial costs, the possibility of requiring treatment for the water, and the requirement for ongoing maintenance.

This pamphlet is meant to help you understand how wells work, the benefits and risks of having a well installed and what to look for, if you decide a well is the right choice for you. Inside, you’ll find information on:

- What is groundwater?
- Types of Wells
- Diagram of a typical water system
- Costs and planning
- Water quality monitoring and well maintenance
- Common water problems and possible solutions
- The basics of water storage tanks

This pamphlet is not intended as a comprehensive overview, but rather as an introduction to some of the issues involved. Please take the time to read this pamphlet and do as much additional research as possible before going making a final decision about whether to install a well. (See the back page for ideas on where to get more information).
THE BASICS

What is groundwater?

Groundwater is water that is found in underground aquifers. Aquifers are fractured rock, sand or gravel zones containing water. The groundwater begins as rain or snowmelt (precipitation). This groundwater can follow three main paths:

• Some evaporates from the ground and open water surfaces, or is ‘breathed’ out (transpired) by vegetation and returns to the atmosphere where it can again form clouds, rain and snow and replenish the earth.

• Some runs off into streams or lakes or the ocean, called surface water runoff.

• Some infiltrates into the ground. There, it follows various routes (flowpaths) and can discharge to the ground surface as springs, discharge into surface water, or recharge groundwater deeper in the earth. As groundwater moves through the ground, it dissolves some of the minerals that it contacts. These dissolved minerals give water its chemical character or quality.
TYPES OF WELLS

Drilled wells access groundwater by boring a hole into an aquifer, with the upper part lined with casing, usually steel. Though much safer than surface water or shallow wells, groundwater wells are still susceptible to contamination and treatment of the water may be required.

Dug or shallow wells usually consist of an excavation (usually with a backhoe or excavator) into the aquifer, and are lined with concrete walls. The walls prevent the collapse of the excavated walls and, along with an apron and seal, exclude surface contaminants from entering the water supply. Water from dug wells are subject to contamination, which means the water will need to be treated before being used for domestic purposes.

Surface wells are wells that draw water directly from a surface source through a variety of piping and pump methods. All surface wells are subject to surface water contamination, which means that the water will require treatment before being used for domestic purposes.
EXAMPLE OF A COMPLETE WATER SYSTEM

Legend
1 submersible pump
2 pump intake
3 check valve and fitting
4 torque arrestor
5 safety cable or rope
6 electric cable
7 electric cable taped or tied to drop pipe every 3 m (10 ft)
8 pitless adaptor
9 vermin-proof vented well cap
10 electrical cable in conduit
11 pump control box and safety switch
12 lightning arrester
13 power disconnect
14 pressure switch
15 pressure tank
16 sampling tap/drain valve
17 relief valve
18 pressure gauge
19 check valve (optional)
20 tank ‘tee’
21 isolation valve
22 discharge line to treatment (if applicable) and house
23 from electrical panel
PLANNING AND COSTS

Before you drill a well, you must also choose an appropriate and suitable location. Land surface features will often play a major role in site selection. Steep slopes and poor drainage areas are considerations when installing any well. Whenever possible, wells should be located at higher elevations than the surrounding areas, to decrease the potential for contamination.

The well should be located and maintained so that it is accessible for cleaning, treatment, repair, testing, inspection and other activities which may be necessary over time.

Additionally, Yukon regulations require minimum setbacks from all likely sources of contamination. The Yukon requires specific setbacks of 100 feet from any source of pollution (and where possible, on higher ground), 30 metres from any soil absorption system or pit privy, and 15 metres from any septic tank, sewage holding tank or contained privy.
Wells can be very expensive and even after investing more than $10,000, there is always the risk that no water will be found. Of course, with careful planning and some research as to how others in your area have fared, these risks can be reduced. So, take the time to visit your neighbours and ask about their experience. Well drillers are also useful sources of information, as they can tell you how far they have drilled in areas around your home.

Another important component of planning a well is evaluating how much water you anticipate using. A conservative estimate is that a home will need about 680 to 1360 liters (160 to 300 gallons) per day for two to four people to meet basic needs. Those needs include everyday uses, like drinking, cooking and plumbing; seasonal uses, like lawn and garden watering; and any other special uses, such as animal watering.

WATER QUALITY MONITORING AND WELL MAINTENANCE

The Yukon is a mineral rich region, which sometimes translates into natural impurities, like arsenic, sulfur and iron, finding their way into well water. Routine testing is required to ensure the safety of your well water. Almost all impurities can be dealt with through appropriate treatment.

Immediately after installing a well, water should be sampled and tested to ensure it meets the Canadian Guidelines on Drinking Water Quality. There are several Yukon businesses that can help homeowners get their water tested at labs around the country. Check the Yellow Pages under Water Purification for a business in your area.

Even if the water meets national drinking water guidelines, further tests should be conducted on an ongoing basis. Environmental Health recommends the following schedule for testing of well water:

- Immediately upon installing the well
- Year One
- Year Two
- Year Five and every subsequent five years

If at any point, there is an inconsistency between tests, regular testing should continue until consistent results are obtained or appropriate treatment system is installed. Thereafter, restart the above schedule to ensure the water meets the national guidelines.

Well water users should also keep abreast of any changes or developments in the national drinking water guidelines.
### COMMON WATER PROBLEMS AND POSSIBLE SOLUTIONS

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>PROBABLE CAUSE</th>
<th>POSSIBLE SOLUTIONS</th>
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<td>Health problems</td>
<td>Coliform bacteria</td>
<td>Investigate source first</td>
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<td>Chlorination, Ultraviolet light Ozonation</td>
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<td>Hard scaly deposits in kettles and piping, bathtub ring, soap scum,</td>
<td>Hardness</td>
<td>Water softener</td>
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<td>high soap consumption</td>
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<td>Red or orange stains on laundry or fixtures, metallic taste, rust</td>
<td>Iron</td>
<td>Water softener, Greensand filter, Chlorination/filtration</td>
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<tr>
<td>particles after water sits</td>
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<td>(depending on concentration)</td>
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<tr>
<td>Black stains on laundry or fixtures, metallic/bitter taste in coffee</td>
<td>Manganese</td>
<td>Water softener, Greensand filter Chlorination/filtration</td>
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<tr>
<td>and tea</td>
<td></td>
<td>(depending on concentration)</td>
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<tr>
<td>Red to brown slime in toilet tank, iron staining, unpleasant taste</td>
<td>Iron bacteria</td>
<td>Shock chlorination of water source and entire system</td>
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<td>or odour</td>
<td></td>
<td>Chlorination/filtration</td>
</tr>
<tr>
<td>Acid water, causing corrosion of piping (green stains due to copper</td>
<td>Low alkalinity, presence of carbonic acid usually,</td>
<td>Soda ash</td>
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<tr>
<td>corrosion)</td>
<td>sometimes mineral acids such as sulfuric acid</td>
<td>Neutralizing tank</td>
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<tr>
<td>Rotten egg odor and flavor, silverware may turn black, worse in hot</td>
<td>Hydrogen sulfide and/or sulfate-reducing bacteria</td>
<td>Greensand filter</td>
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<tr>
<td>water</td>
<td></td>
<td>Chlorination/filtration</td>
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<tr>
<td>Cloudy, dirty or muddy appearance</td>
<td>Turbidity</td>
<td>Fine filters (sand diatomaceous earth), Coagulation (alum &amp; filtration)</td>
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<td>High blood pressure</td>
<td>Sodium</td>
<td>Reverse osmosis, Distillation (single tap)</td>
</tr>
<tr>
<td>Salty taste, corrosive</td>
<td>Chloride</td>
<td>Reverse osmosis, Distillation (single tap), Anion exchange</td>
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<tr>
<td>Gas bubbles escaping from water</td>
<td>Gases such as methane</td>
<td>Aeration, Activated carbon</td>
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<tr>
<td>Laxative effects</td>
<td>Sulfate</td>
<td>Reverse osmosis, Distillation (single tap), Anion exchange</td>
</tr>
<tr>
<td>Health problems</td>
<td>Arsenic</td>
<td>Reverse osmosis, Distillation, Activated alumina, Ferric hydroxide, Anion exchange</td>
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<tr>
<td>Health problems</td>
<td>Uranium</td>
<td>Reverse osmosis, Distillation (single tap)</td>
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<tr>
<td>Oily smell or film on water</td>
<td>Gasoline and/or oil</td>
<td>Investigate and eliminate source first</td>
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<td></td>
<td></td>
<td>Activated carbon, Gravity separation</td>
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<tr>
<td>‘Blue babies’ in formula-fed infants under 6 months</td>
<td>Nitrate</td>
<td>Reverse osmosis, Anion exchange</td>
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<tr>
<td></td>
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<td>Use nitrate-free water for infant formula preparation</td>
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If well water is found to be contaminated, there is an array of treatment options available for specific contaminant issues. Whatever treatment system you choose, ensure it is the appropriate system for the contaminants found in your well and that it is approved by a recognized standards agency, such as the Canadian Standards Association, Underwriters Laboratories or NSF International. All treatment systems will require regular upkeep and maintenance, which should always be done according to manufacturer’s instructions.
WATER STORAGE TANKS

All storage tanks require regular cleaning and maintenance. Not maintaining your storage tank could put you, your family or anyone who uses water in your home at a health risk.

Tanks should be cleaned at least once a year or more often, if required. Cleaning a tank regularly will remove algae (which can create odours and bad taste), silt and bacteria that may be harmful.

To ensure cleaning is easy, all holding tanks should be located in an easily accessible area. Tanks should also be kept out of direct sunlight and, if possible, in an enclosed location specifically designed for the purposes of tank storage.

Additional information on cleaning and maintenance for water storage tanks can be obtained through the Environmental Health Branch of the Department of Health and Social Services on the web at www.hss.gov.yk.ca or by phone at 667-8391.

WHERE TO GET MORE INFORMATION:

Health Canada (www.hc-sc.gc.ca)
Canadian Ground Water Association (www.cgwa.org)
BC Water and Waste Association (www.bcwwa.org)
Canadian Water Quality Association (www.cwqa.com)

Additional information may also be available from the Environmental Health Branch of the Department of Health and Social Services on the web at www.hss.gov.yk.ca or by phone at 667-8391.

Local well and water contractors may also be able to provide extra information and resources. Just look under Well Drillers or Water Purification in the local Yellow Pages.